

WHAT IS CLAIMED IS:

1. An electron source forming substrate comprising an insulating material film provided on a substrate surface where an electron-emitting device is arranged, wherein said insulating material film contains a metallic oxide and has a vacancy.

2. The electron source forming substrate according to claim 1, wherein said metallic oxide is an electronically conductive oxide. 21

3. The electron source forming substrate according to claim 1, wherein said metallic oxide is  $\text{SnO}_2$ . 28

4. The electron source forming substrate according to any one of claims 1 to 3, wherein said insulating material film has a ratio of said vacancy in its cross section within the range of 5% to 10%. 12, 30

5. The electron source forming substrate according to any one of claims 1 to 3, wherein a thickness of said insulating material film is within the range of 150 nm to 3  $\mu\text{m}$ . 12, 17

6. The electron source forming substrate 14, 21

according to any one of claims 1 to 3, wherein said insulating material film further contains phosphorus.

7. The electron source forming substrate  
5 according to any one of claims 1 to 3, wherein the insulating material of said insulating material film is  $\text{SiO}_2$ . 15, 16, 17, 26, 30, 31

8. The electron source forming substrate  
10 according to any one of claims 1 to 3, wherein on said insulating material film, a film comprising an insulating material is further laminated.

9. The electron source forming substrate  
15 according to claim 8, wherein the thickness of the film comprising said insulating material is within the range of 20 nm to 3  $\mu\text{m}$ .

10. The electron source forming substrate  
20 according to claim 8, wherein said insulating material is  $\text{SiO}_2$ .

11. An electron source forming substrate  
25 comprising an insulating material film provided on a substrate surface where a electron emitting device is arranged, wherein said insulating material film

contains a plurality of metallic oxide particles and vacancy are provided among said plurality of metallic oxide particles.

5           12. The electron source forming substrate according to claim 11, wherein said insulating material film has a ratio of said vacancy in its cross section within the range of 5% to 10%.

10           13. The electron source forming substrate according to claim 11 or 12, wherein the thickness of said insulating material film is within the range of 150 nm to 3  $\mu$ m.

15           14. The electron source forming substrate according to any one of claims 11 or 12, wherein said insulating material film further contains phosphorus.

20           15. The electron source forming substrate according to any one of claims 11 or 12, wherein the insulating material of said insulating material film is  $\text{SiO}_2$ .

25           16. The electron source forming substrate according to any one of claims 11 or 12, wherein on said insulating material film, a film comprising an

insulating material is further laminated.

17. The electron source forming substrate according to claim 16, wherein the thickness of the film made of said insulating material is within the range of 20 nm to 3  $\mu$ m.

18. The electron source forming substrate according to claim 16, wherein said insulating material is  $\text{SiO}_2$ .

19. An electron source forming substrate comprising an insulating material film provided on a substrate surface where an electron emitting device is arranged, wherein said insulating material film contains a plurality of metallic oxide particles, said plurality of the contained metallic oxide particles form a metallic oxide particle layer between said substrate surface and said insulating material film surface in said insulating material film, and vacancy is provided in said metallic oxide particle layer.

20. The electron source forming substrate according to claim 19, wherein said metallic oxides particle layer has a ratio of said vacancy in its cross section within the range of 5% to 10%.

22. The electron source forming substrate  
5 according to claim 19 or 20, wherein the insulating  
material of said insulating material film is  $\text{SiO}_2$ .

24. The electron source forming substrate according to claim 11 or 19, wherein the average particle size of said plurality of metallic oxide particles is within the range of 6 nm to 20 nm..

25. The electron source forming substrate according to claim 11 or 19, wherein the size of said  
20 vacancy is within the range of 0.1 to 5 times the average particle size of said plurality of metallic oxide particles.

26. The electron source forming substrate  
25 according to claim 11 or 19, wherein the size of said  
vacancy is within the range of 0.1 to 2 times the

average particle size of said plurality of metallic oxide particles.

27. The electron source according to claim 11 or  
5 19, wherein said metallic oxide particles are electronically conductive particles. 2

28. The electron source forming substrate  
according to claim 11 or 19, wherein said metallic  
10 oxide particles are particles of  $\text{SnO}_2$ . 3

29. The electron source forming substrate  
according to any one of claims 1, 11 or 19, wherein  
said substrate is a substrate containing sodium.  
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30. The electron source forming substrate  
according to claim 29, wherein said insulating material  
film is a sodium blocking film. 7, 21

20 31. The electron source forming substrate according to any one of claims 1, 11 or 19, wherein said insulating material film is a antistatic film.

25 32. An electron source, comprising a substrate and an electron-emitting device arranged on said substrate, wherein said substrate is the electron

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source forming substrate according to any one of claims 1, 11 or 19.

33. The electron source according to claim 32, wherein said electron-emitting device is an electron-emitting device comprising an conductive film including an electron-emitting portion.

10 34. The electron source according to claim 32, wherein a plurality of said electron-emitting devices are matrix-wired by a plurality of row-directional wirings and a plurality of column-directional wirings.

15 35. An image display apparatus comprising an electron-emitting device an image display member for displaying images by irradiation of electron from said electron-emitting device and an envelope in which said electron-emitting device and said image display member are arranged, wherein a substrate where said electron-emitting device is arranged are electron source forming substrate according to any one of claims 1, 11 or 19.

25 36. The image display apparatus according to claim 35, wherein said electron-emitting devices are electron-emitting devices comprising an conductive film containing the electron-emitting portion.

37. The image display apparatus according to  
claim 35, wherein a plurality of said electron-emitting  
devices are matrix-wired by a plurality of row-  
directional wirings and a plurality of column-  
5 directional wirings.

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